



# BD677/A/679/A/681 BD678/A/680/A/682

## COMPLEMENTARY SILICON POWER DARLINGTON TRANSISTORS

- STMicroelectronics PREFERRED SALESTYPES
- COMPLEMENTARY PNP - NPN DEVICES
- MONOLITHIC DARLINGTON CONFIGURATION
- INTEGRATED ANTIPARALLEL COLLECTOR-EMITTER DIODE

### APPLICATION

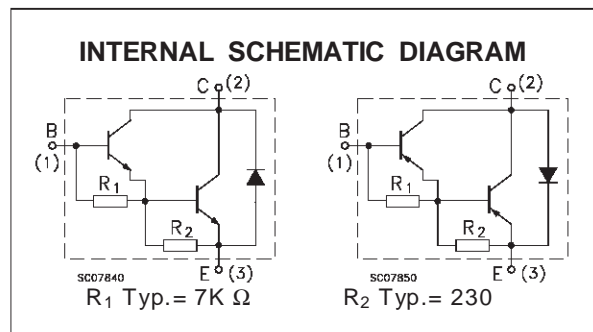
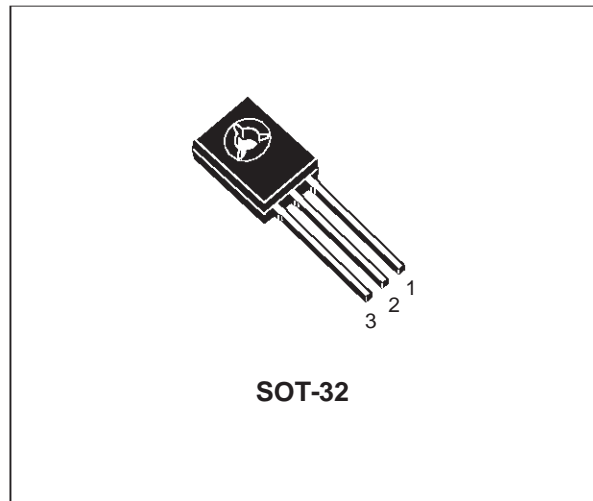
- LINEAR AND SWITCHING INDUSTRIAL EQUIPMENT

### DESCRIPTION

The BD677, BD677A, BD679, BD679A and BD681 are silicon epitaxial-base NPN power transistors in monolithic Darlington configuration mounted in Jedec SOT-32 plastic package.

They are intended for use in medium power linear and switching applications

The complementary PNP types are BD678, BD678A, BD680, BD680A and BD682 respectively.



### ABSOLUTE MAXIMUM RATINGS

| Symbol    | Parameter                                  | Value      |         |         | Unit       |       |
|-----------|--|------------|---------|---------|------------|-------|
|           |  | NPN        | BD677/A | BD679/A |            | BD681 |
|           |  | PNP        | BD678/A | BD680/A |            | BD682 |
| $V_{CBO}$ | Collector-Base Voltage ( $I_E = 0$ )       | 60         | 80      | 100     | V          |       |
| $V_{CEO}$ | Collector-Emitter Voltage ( $I_B = 0$ )    | 60         | 80      | 100     | V          |       |
| $V_{EBO}$ | Emitter-Base Voltage ( $I_C = 0$ )         | 5          |         |         | V          |       |
| $I_C$     | Collector Current                          | 4          |         |         | A          |       |
| $I_{CM}$  | Collector Peak Current                     | 6          |         |         | A          |       |
| $I_B$     | Base Current                               | 0.1        |         |         | A          |       |
| $P_{tot}$ | Total Dissipation at $T_c \leq 25^\circ C$ | 40         |         |         | W          |       |
| $T_{stg}$ | Storage Temperature                        | -65 to 150 |         |         | $^\circ C$ |       |
| $T_j$     | Max. Operating Junction Temperature        | 150        |         |         | $^\circ C$ |       |

For PNP types voltage and current values are negative.

# BD677/677A/678/678A/679/679A/680/680A/681/682

## THERMAL DATA

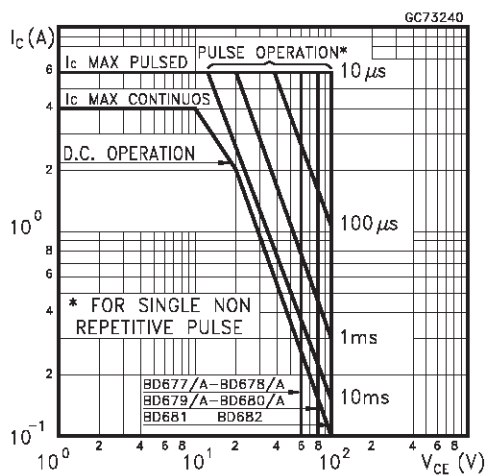
|                       |                                     |     |      |      |
|-----------------------|-------------------------------------|-----|------|------|
| R <sub>thj-case</sub> | Thermal Resistance Junction-case    | Max | 3.12 | °C/W |
| R <sub>thj-amb</sub>  | Thermal Resistance Junction-ambient | Max | 100  | °C/W |

## ELECTRICAL CHARACTERISTICS (T<sub>case</sub> = 25 °C unless otherwise specified)

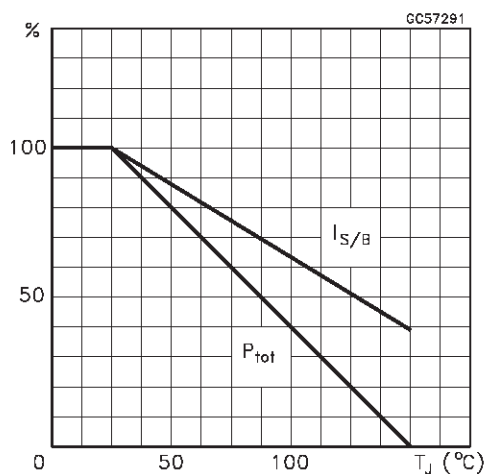
| Symbol                 | Parameter                                      | Test Conditions  | Min.            | Typ. | Max.       | Unit        |
|------------------------|--|--|-----------------|------|------------|-------------|
| I <sub>CBO</sub>       | Collector Cut-off Current (I <sub>E</sub> = 0) | V <sub>CE</sub> = rated V <sub>CBO</sub><br>V <sub>CE</sub> = rated V <sub>CBO</sub> T <sub>C</sub> = 100 °C   |                 |      | 0.2<br>2   | mA<br>mA    |
| I <sub>CEO</sub>       | Collector Cut-off Current (I <sub>B</sub> = 0) | V <sub>CE</sub> = half rated V <sub>CEO</sub>  |                 |      | 0.5        | mA          |
| I <sub>EBO</sub>       | Emitter Cut-off Current (I <sub>C</sub> = 0)   | V <sub>EB</sub> = 5 V  |                 |      | 2          | mA          |
| V <sub>CEO(sus)*</sub> | Collector-Emitter Sustaining Voltage           | I <sub>C</sub> = 50 mA<br>for <b>BD677/677A/678/678A</b><br>for <b>BD679/679A/680/680A</b><br>for <b>BD681/682</b>   | 60<br>80<br>100 |      |            | V<br>V<br>V |
| V <sub>CE(sat)*</sub>  | Collector-Emitter Saturation Voltage           | for <b>BD677/678/679/680/681/682</b><br>I <sub>C</sub> = 1.5 A I <sub>B</sub> = 30 mA<br>for <b>BD677A/678A/679A/680A</b><br>I <sub>C</sub> = 2 A I <sub>B</sub> = 40 mA |                 |      | 2.5<br>2.8 | V<br>V      |
| V <sub>BE*</sub>       | Base-Emitter Voltage                           | for <b>BD677/678/679/680/681/682</b><br>I <sub>C</sub> = 1.5 A V <sub>CE</sub> = 3 V<br>for <b>BD677A/678A/679A/680A</b><br>I <sub>C</sub> = 2 A V <sub>CE</sub> = 3 V   |                 |      | 2.5<br>2.5 | V<br>V      |
| h <sub>FE*</sub>       | DC Current Gain                                | for <b>BD677/678/679/680/681/682</b><br>I <sub>C</sub> = 1.5 A V <sub>CE</sub> = 3 V<br>for <b>BD677A/678A/679A/680A</b><br>I <sub>C</sub> = 2 A V <sub>CE</sub> = 3 V   | 750<br>750      |      |            |             |
| h <sub>fe</sub>        | Small Signal Current Gain                      | I <sub>C</sub> = 1.5 A V <sub>CE</sub> = 3 V f = 1 MHz   | 1               |      |            |             |

\* Pulsed: Pulse duration = 300 ms, duty cycle 1.5 %

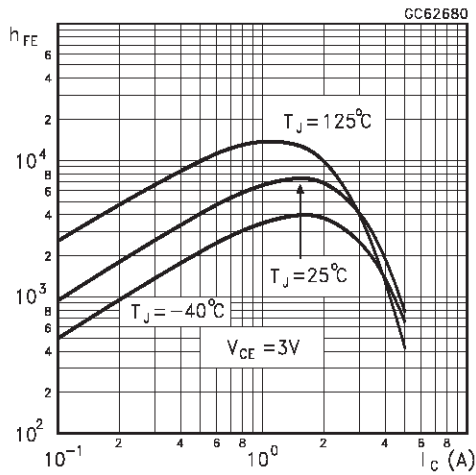
## Safe Operating Areas



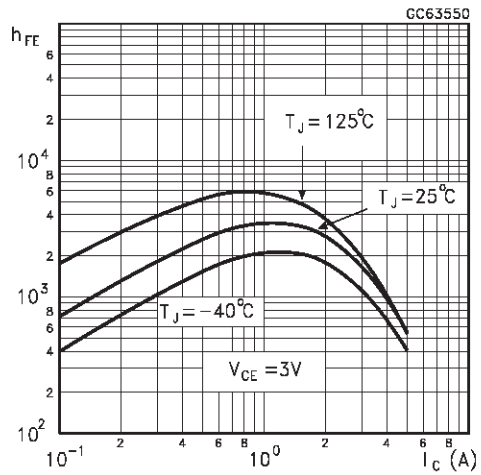
## Derating Curve



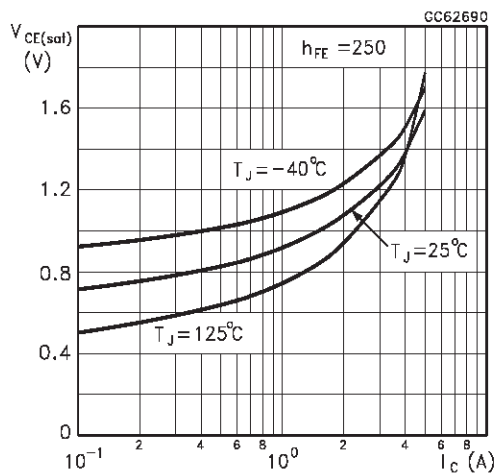
DC Current Gain (NPN type)



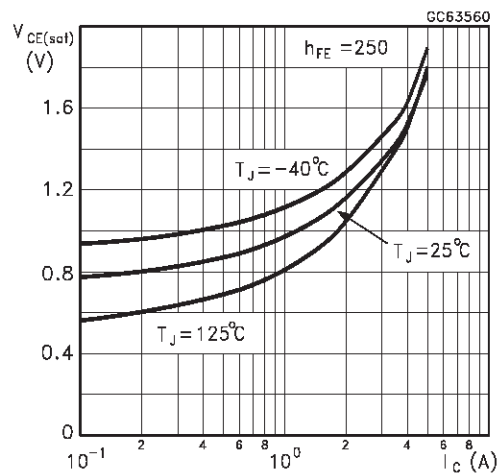
DC Current Gain (PNP type)



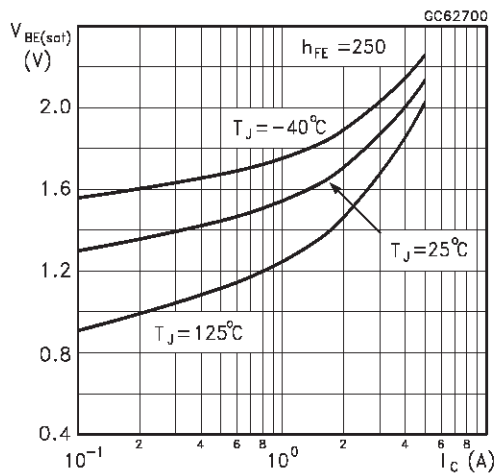
Collector-Emitter Saturation Voltage (NPN type)



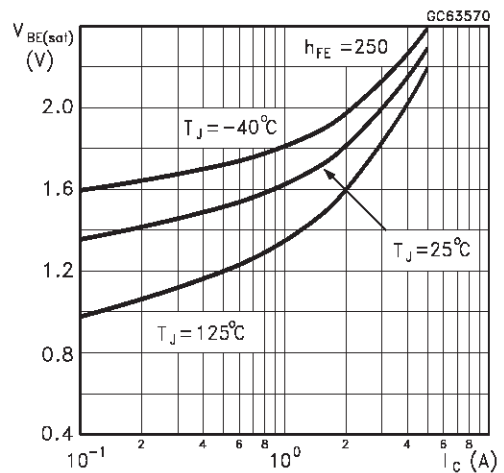
Collector-Emitter Saturation Voltage (PNP type)



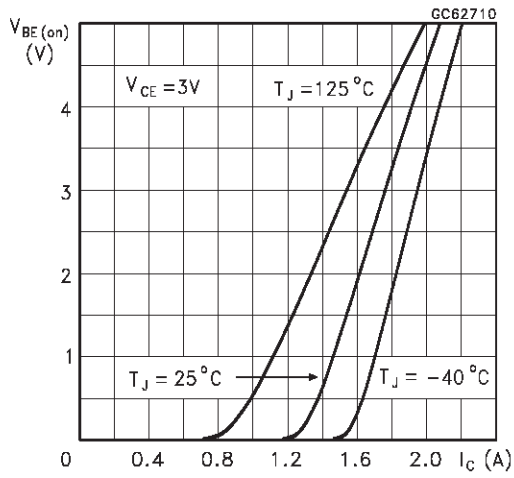
Base-Emitter Saturation Voltage (NPN type)



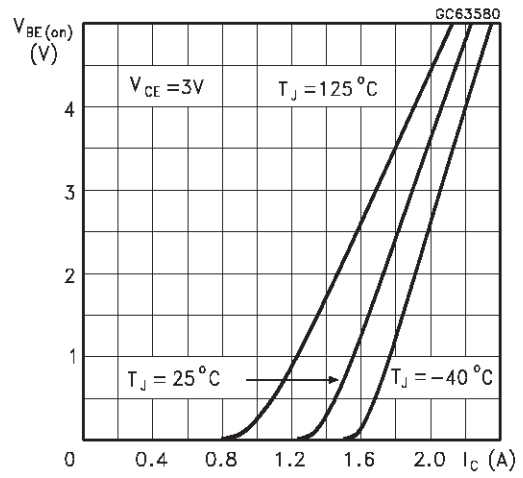
Base-Emitter Saturation Voltage (PNP type)



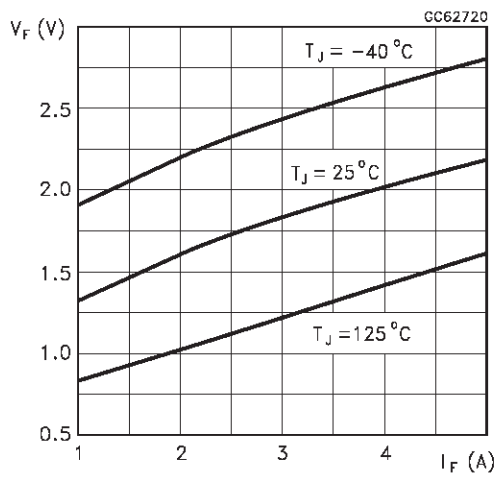
Base-Emitter On Voltage (NPN type)



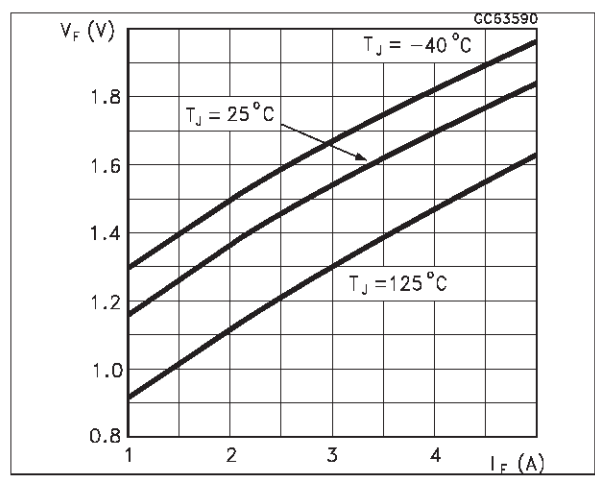
Base-Emitter On Voltage (PNP type)



Freewheel Diode Forward Voltage (NPN types)

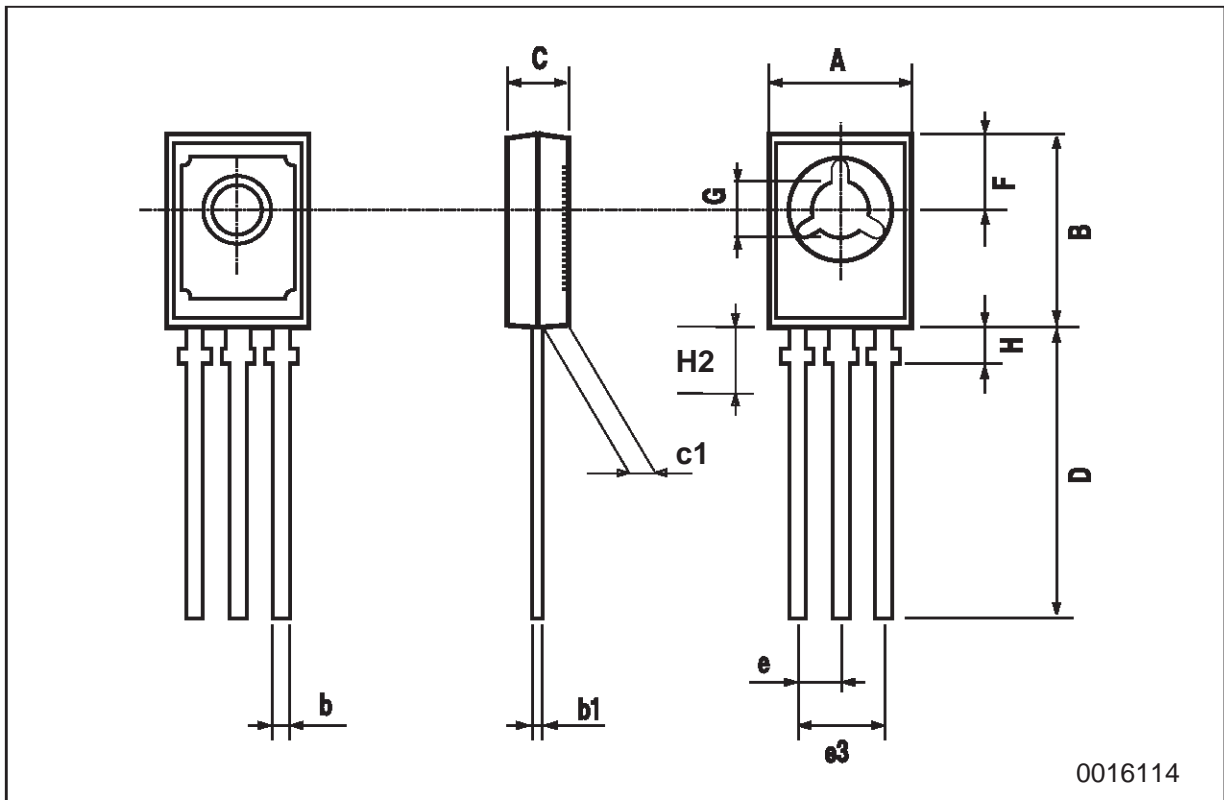


Freewheel Diode Forward Voltage (PNP types)



**SOT-32 (TO-126) MECHANICAL DATA**

| DIM. | mm   |      |      | inch  |       |       |
|------|------|------|------|-------|-------|-------|
|      | MIN. | TYP. | MAX. | MIN.  | TYP.  | MAX.  |
| A    | 7.4  |      | 7.8  | 0.291 |       | 0.307 |
| B    | 10.5 |      | 10.8 | 0.413 |       | 0.445 |
| b    | 0.7  |      | 0.9  | 0.028 |       | 0.035 |
| b1   | 0.49 |      | 0.75 | 0.019 |       | 0.030 |
| C    | 2.4  |      | 2.7  | 0.040 |       | 0.106 |
| c1   | 1.0  |      | 1.3  | 0.039 |       | 0.050 |
| D    | 15.4 |      | 16.0 | 0.606 |       | 0.629 |
| e    |      | 2.2  |      |       | 0.087 |       |
| e3   | 4.15 |      | 4.65 | 0.163 |       | 0.183 |
| F    |      | 3.8  |      |       | 0.150 |       |
| G    | 3    |      | 3.2  | 0.118 |       | 0.126 |
| H    |      |      | 2.54 |       |       | 0.100 |



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